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Marrying Anaerobic Digestion to a Composting Facility

Kansas DH&E Dept.

2011 Works! Conference

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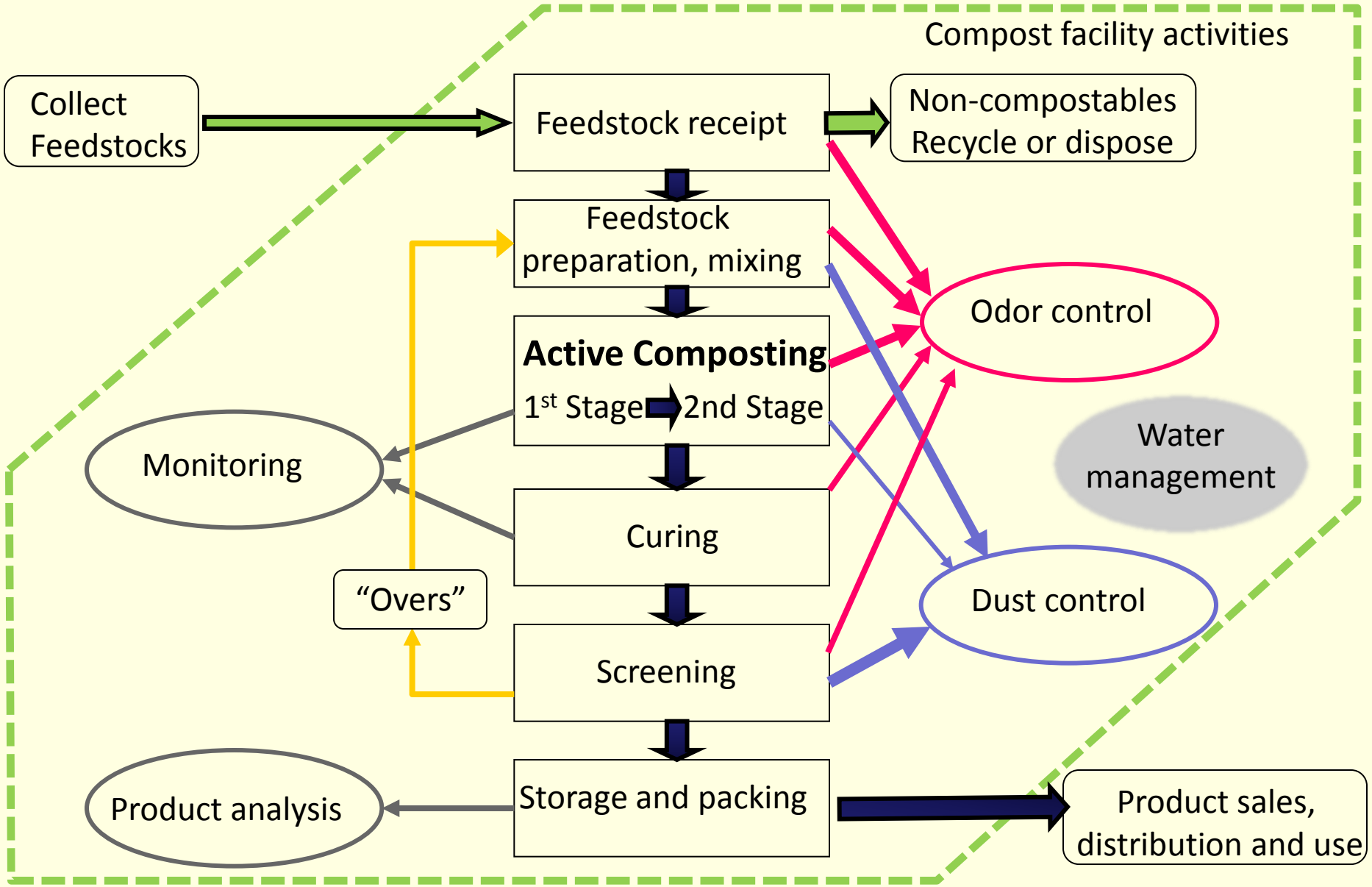
What is Composting?

- An aerobic (with oxygen) biological manufacturing process
- Consists of volumetric materials handling systems
- Process efficiencies are critical
  - *No material moves more than twice in same physical condition*
- Products – composts, custom soil blends, mulches

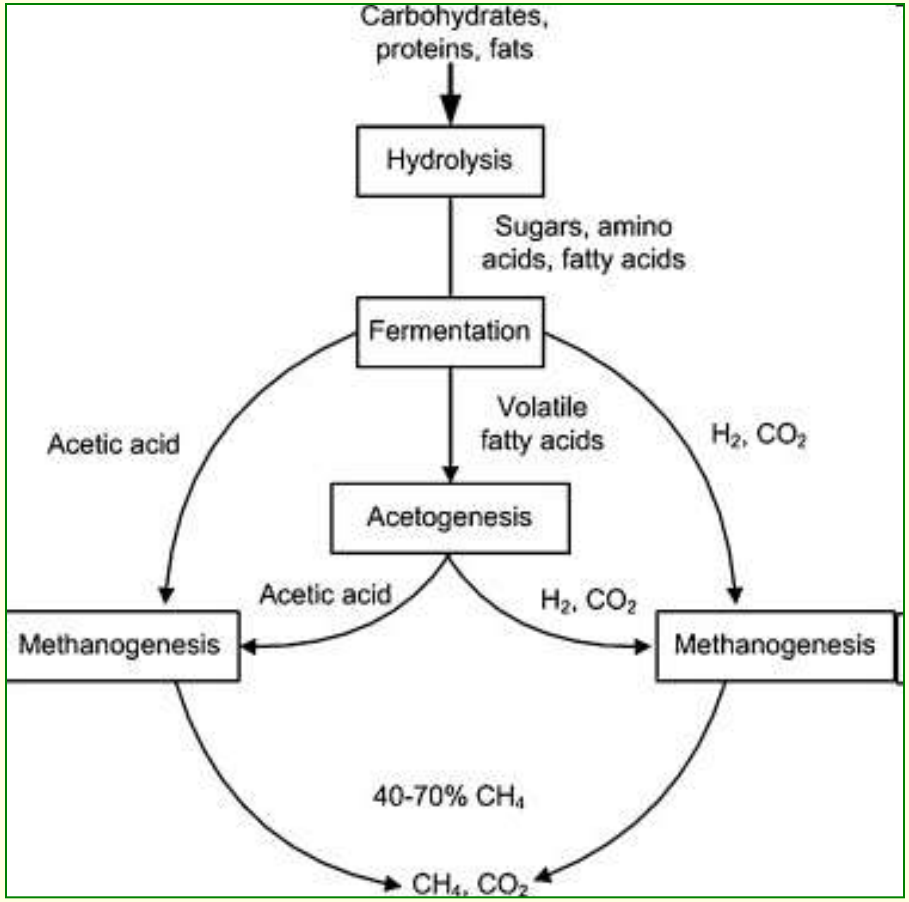
Flow of materials and activities at the compost facility



Composting as a Business

- Revenue from gate fees and from product sales
- Gate fees
  - Derived from waste management contracts
  - Some feedstocks won't produce revenues
    - Agricultural residuals, animal manures
- Product sales
  - Seasonal
  - Multiple products in product family essential

What is Digestion?



- Decomposition in absence of oxygen
- Conversion of organic carbon compounds to methane and CO_2
- Operates at mesophilic temperatures
- Residual is called digestate

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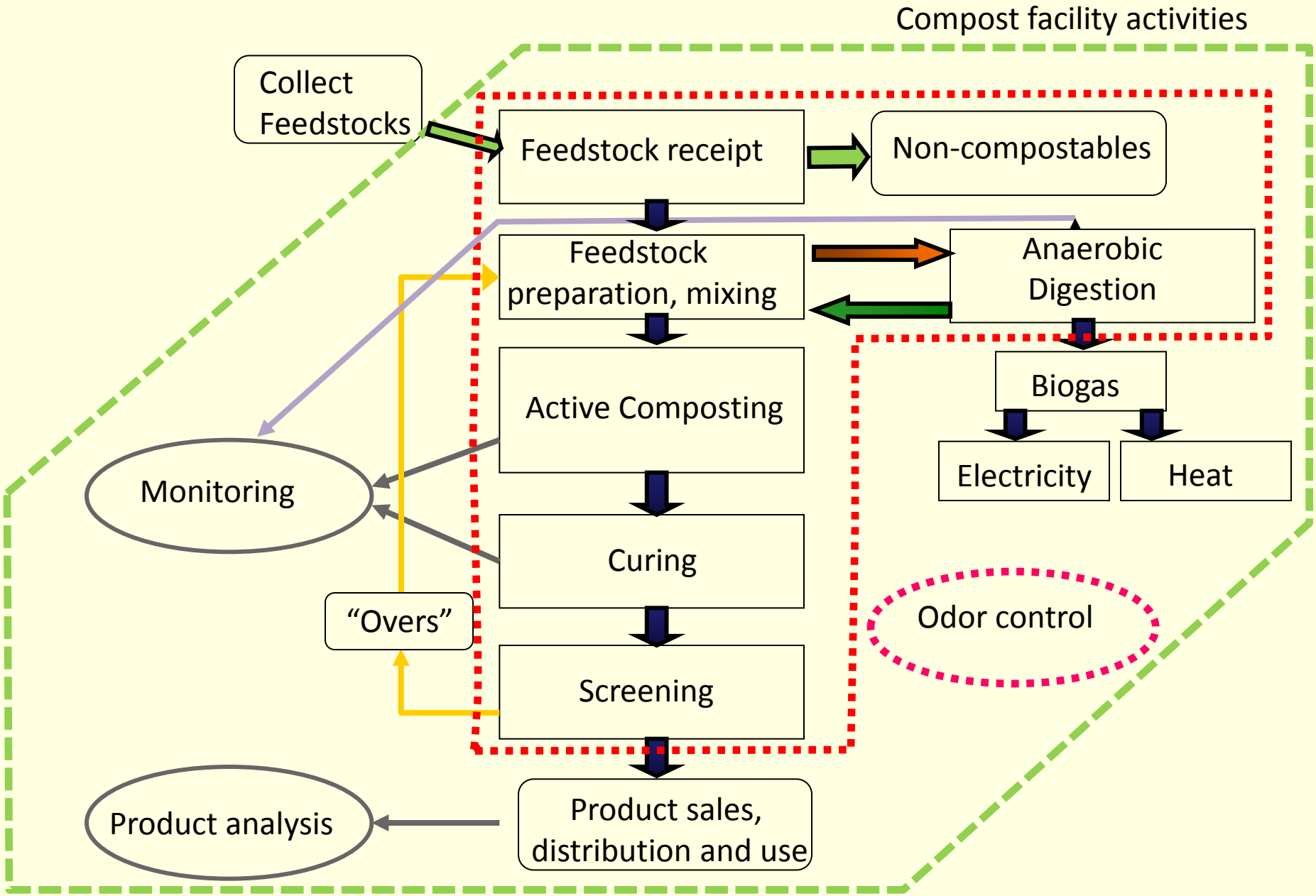
Why Add Digestion?

- To add products to the portfolio
  - Electricity
  - Biofuels
  - Heat recovery & reuse
- Advantages of adding digestion
  - Existing manufacturing environment
  - Sites already approved for waste mgt.
  - Contracts for waste mgt. in place

With Digestion and Product Biogas/Energy Recovery



Feedstocks for Biogas

- In U.S., feedstocks with best biogas potential are industrial sources:
  - Rendering wastes
  - Fish processing residuals
  - Bakery wastes
  - Food processing residuals
- Next best – animal manures, food scraps
- Commercial/residential food scraps
  - High contamination; can be hard to get multi-yr contracts

Digestate Management

- If liquid or slurry, either land-apply (if farms within 20 mi.) or dewater for composting
- If/when solid, mix with fresh yard trimmings or similar high VS-high structure material for composting
  - Plan on 60% digestate / 40% fresh feedstock
  - Shoot for C:N = 25:1, Moisture = 50%, VS > 80%
  - Compost in windrows with compost blanket
    - Don't turn windrows for 1st 5 – 7 days for odor control
  - Compost in negative aeration ASP

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Digestate Compost Quality

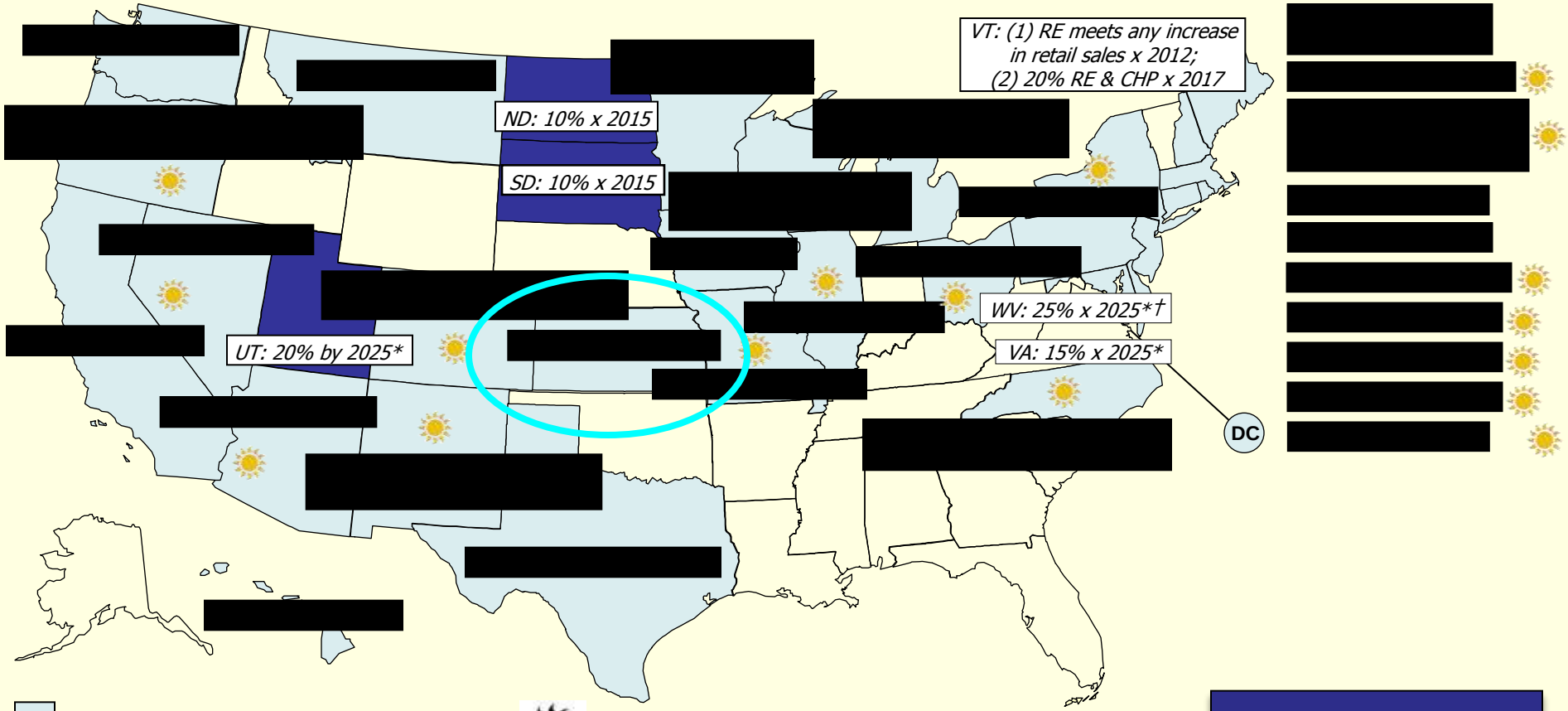
- With agricultural or industrial feedstocks, should be good quality compost
- With I/C/I or residential food scraps, plastics contamination is a likely problem
  - Can reduce market value from $20/CY to $6/CY

Challenges of Adding Digestion

- Need to marry type of AD to feedstocks
  - Sludges & manures – wet (liquid) digesters
  - Food scraps – slurry to send to wet or use HSAD
  - Yard trimmings – only as bulking agent in HSAD
- Feedstock & digestate processing
  - Changing physical state (solid↔slurry↔liquid) costs money
- Health & Safety
  - Flammable gas management
- Electricity purchase agreements
  - RPS states have other options (hydro, wind, etc.)

Renewable Portfolio Standards - - Kansas – 20% of peak demand by 2020

www.dsireusa.org / May 2010



State renewable portfolio standard

State renewable portfolio goal

Minimum solar or customer-sited requirement

* Extra credit for solar or customer-sited renewables

† Includes non-renewable alternative resources

29 states + DC have an RPS

(6 states have goals)

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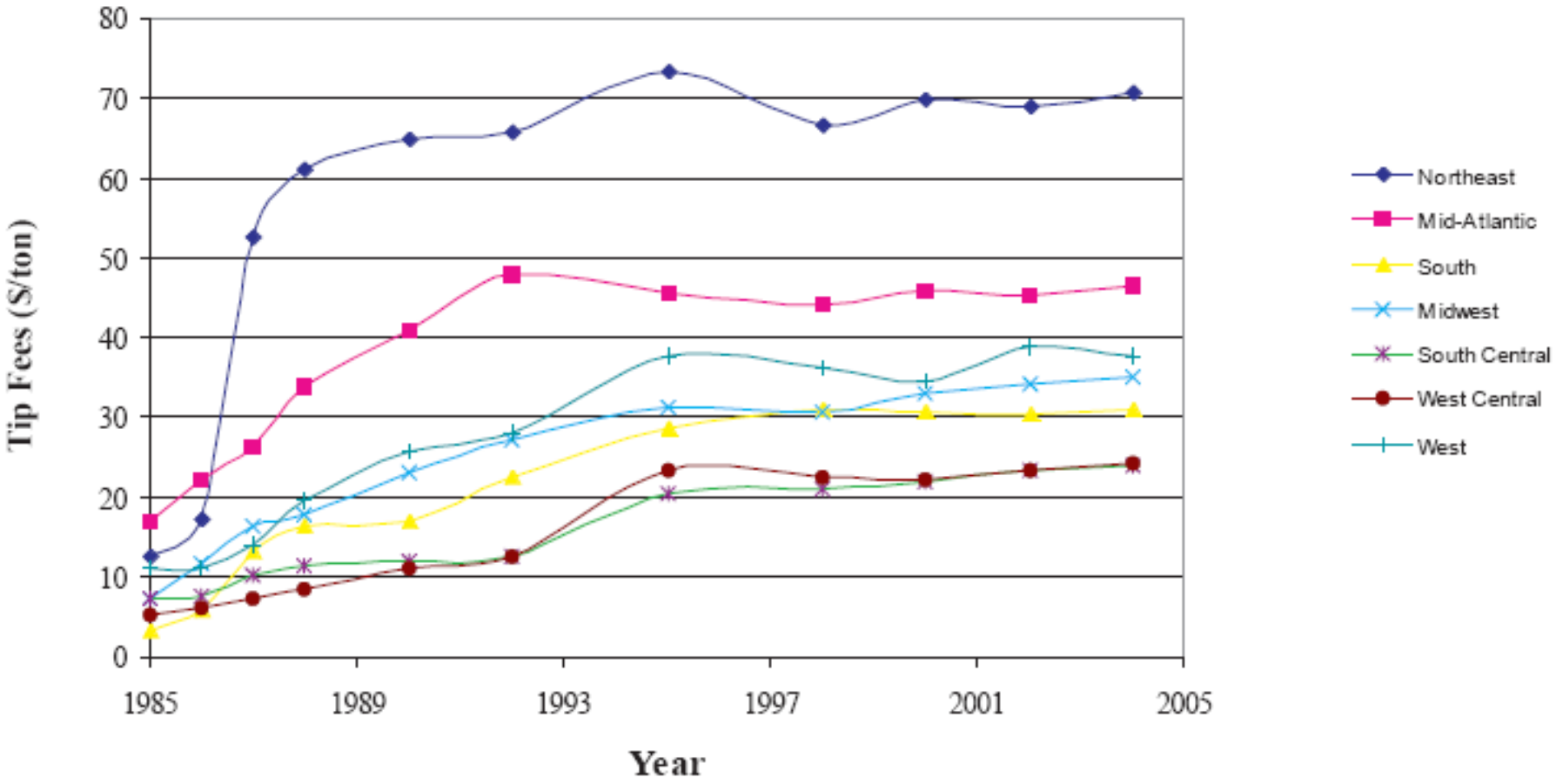
More challenges

- Heat Recovery
  - Need nearby user
- Odor Potential & PR Problems
  - Land applying or composting digestate
- Regulatory Approval
  - Some states struggling with how to regulate AD of solid wastes
- Still competing with landfill tip fees
  - Challenging economics in many areas

Landfill Tip Fees

(2005 Data from NSWMA)



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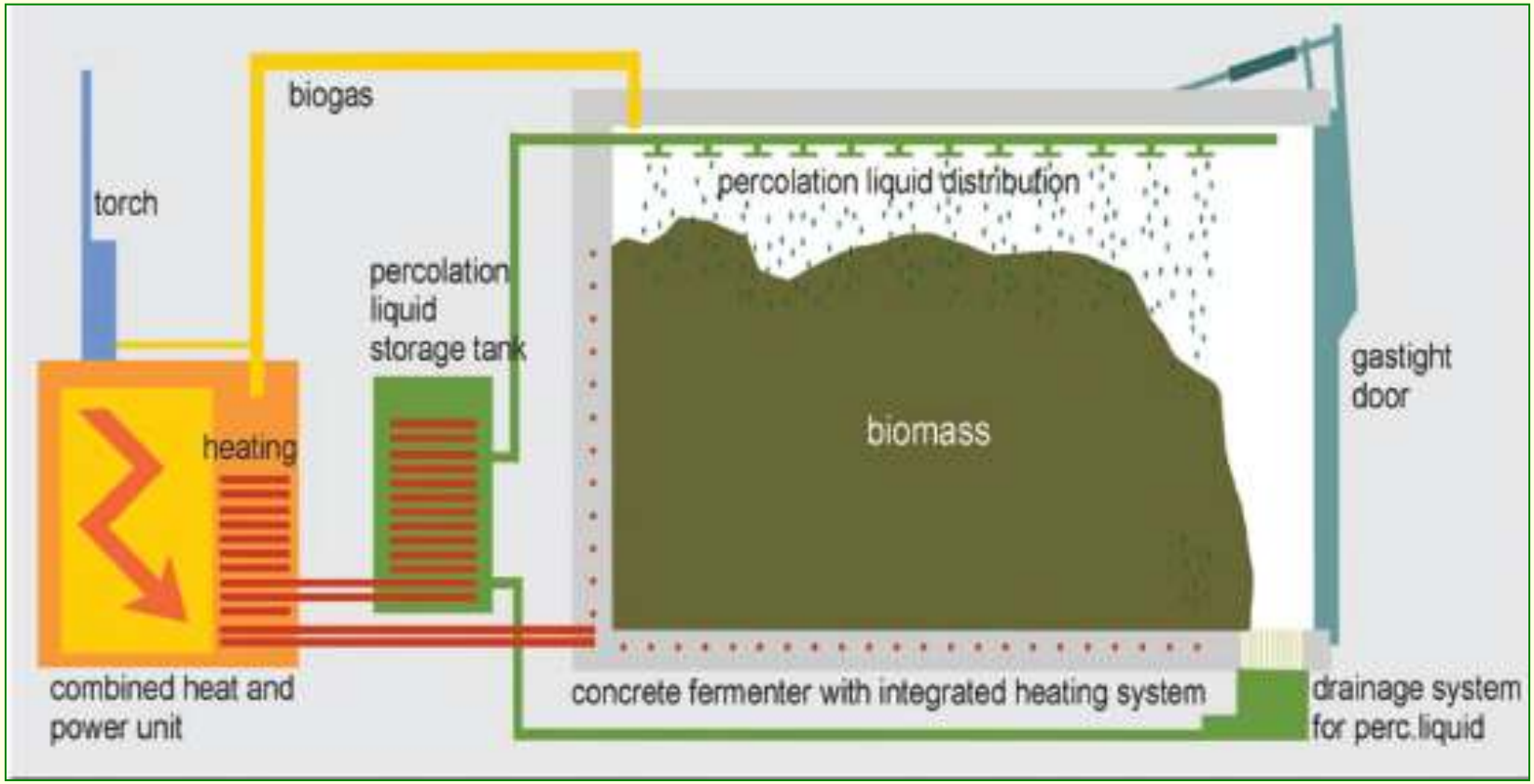
Solid Waste Digestion

European Percolation Reactors



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Potential Capital Costs for Percolation Reactors

Capacity (tons/year)	*25,000* → *50,000*	→ *100,000*
Reactors	$8,000,000	→ $30,000,000
CHP Engine, generator, etc.	$750,000	→ $3,500,000
Biomethane System	$1,250,000	→ $5,000,000

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iAD – integrated Anaerobic Digestion

- Developed in 2010 by Ohio Ag R&D Center
- Liquid digestion of animal manures to create biogas
- Digestate used as liquid in percolation reactor containing ag residuals (corn stover, wheat straw, etc.) for more biogas
- Perc reactor digestate to composting
- Logical linkage between manure and solid waste digestion/composting

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Recommendations to Composters

- Investigate energy markets carefully
  - Electricity production & sale
  - Biogas cleanup to RNG for fleet use
  - Heat recovery for nearby user
  - Secure contracts for recovered energy
- Ensure right AD technology for your feedstock(s) – dry / slurry / liquid
- Consider operational, H&S impacts of:
  - Liquids & flammable gas management

Questions?

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